

0049524

CERTIFICATE OF ANALYSIS

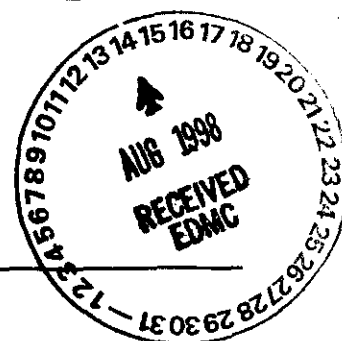
Bechtel Hanford, Inc.
3350 George Washington Way
Richland, WA 99352

May 19, 1998

Attention: Joan Kessner



SAF Number	:	B98-068
Date First Sample Received	:	April 14, 1998
Number of Samples	:	One (1)
Sample Type	:	Other-Liquid
SDG Number	:	W02329
Data Deliverable	:	15 Day Priority/21 Day Summary



I. Introduction

On April 14, 1998, one 15-day TAT "other" sample was received by the Quanterra Environmental Services Richland Laboratory (QESRL) for radiochemical and chemical analysis. Upon receipt, the sample was assigned the following laboratory ID number to correspond with the Bechtel Hanford, Inc. (BHI) specific ID:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80423801	B0NKH3	Other-Liquid	4/14/98

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

Alpha Spectroscopy
Americium-241, Curium-244 by method RICH-RC-5057
Plutonium-238, 239/40 by method RICH-RC-5010
Gamma Spectroscopy
Gamma Scan by method RICH-RC-5017

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Gas Proportional Counting
Gross Alpha by method RICH-RC-5014
Gross Beta by method RICH-RC-5014

III. Quality Control

The analytical results for each analysis performed under SDG W02329 include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

Alpha Spectroscopy

Americium-241, Curium-244 by method RICH-RC-5072

The LCS from the initial analysis was not within contractual requirements. In addition, high sample activity caused interference with the tracer recovery. Therefore, we increased the dilution of this sample and performed a reanalysis. The LCS, batch blank, duplicate sample (BONKH3) and sample results from the reanalysis are within contractual requirements.

Plutonium-238, 239/40 by method RICH-RC-5010

High sample activity caused interference with the tracer recovery, therefore, we increased the dilution of this sample and performed a reanalysis. The reanalysis results did not agree with the original analysis, therefore, we performed a second reanalysis. The LCS, batch blank and sample results from the second reanalysis are within contractual requirements. The duplicate sample (BONKH3) had an RPD of 44 % for the Pu-238 and 37 % for the Pu-239. Second level RPD evaluation criteria is less than or equal to 40 % for water samples.

Gamma Spectroscopy

Gamma Scan by method RICH-RC-5017

The LCS, batch blank, duplicate sample (BONKH3) and sample results are within contractual requirements. The MDA values for this sample were elevated since the sample was classified as a category III and a reduced volume of sample was used in the analysis.

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Gas Proportional Counting

Gross Alpha by method RICH-RC-5014

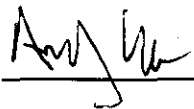
The LCS, batch blank, duplicate sample (B0NKH3) and sample results are within contractual requirements.

Gross Beta by method RICH-RC-5014

The LCS, batch blank and sample results are within contractual requirements. The duplicate from the original analysis did not meet the requirements of the contract, therefore, the duplicate (and target sample) were reanalyzed. The duplicate sample (B0NKH3) results are within contractual requirements.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:



Andy Kopriva
Project Manager

SAMPLE RESULTS

LAB NAME:	QUANTERRA, Richland	SDG: /RPT GRP:	W02329 / 5111
LAB SAMPLE ID:	80423801	MATRIX:	OTHER
CLIENT ID:	B0NKH3	DATE RECEIVED:	4/14/1998 2:30:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
AM-241	1.87E+07		4.9E+05	2.0E+06	1.61E+04	pCi/L	91.70%	RICHRC5057
CM-242	0.00E+00	U	0.0E+00	9.7E+03	8.73E+03	pCi/L	91.70%	RICHRC5057-C
CM-244	0.00E+00	U	0.0E+00	9.7E+03	8.73E+03	pCi/L	91.70%	RICHRC5057-W
PU-238	2.07E+05		3.5E+04	4.0E+04	8.13E+03	pCi/L	82.80%	RICHRC5010
PU239/40	1.30E+07		2.7E+05	1.3E+06	8.13E+03	pCi/L	82.80%	RICHRC5010
AM-241	2.34E+07		1.1E+06	2.6E+06	N/A	pCi/L	N/A	RICHRC5017
CO-60	6.06E+03	U	2.1E+04	2.1E+04	4.55E+04	pCi/L	N/A	RICHRC5017
CS-137DA	1.17E+04	U	1.6E+04	1.6E+04	3.38E+04	pCi/L	N/A	RICHRC5017
EU-152	2.19E+03	U	4.0E+04	4.0E+04	7.40E+04	pCi/L	N/A	RICHRC5017
EU-154	-1.64E+04	U	4.6E+04	4.6E+04	8.33E+04	pCi/L	N/A	RICHRC5017
EU-155	-2.05E+04	U	4.5E+04	4.5E+04	7.30E+04	pCi/L	N/A	RICHRC5017
RA-226	3.21E+04	U	4.3E+04	4.3E+04	8.24E+04	pCi/L	N/A	RICHRC5017
ALPHA	3.58E+07		5.4E+05	7.5E+06	1.48E+04	pCi/L	100.00%	RICHRC5014
BETA	4.03E+06		3.5E+04	3.8E+05	2.65E+03	pCi/L	100.00%	RICHRC5014-B

Number of Results: 14

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Reanalysis

Work Order number (sk) <u>804238</u>				
Client ID: <u>BH I</u>				
Due Date: <u>4-29-98</u>				
Lab Sample Number or SDG: <u>WP2329</u>				
Method Test Parameters: <u>Am / cm</u>				
Matrix: <u>Other (Liquid)</u>				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?	✓			✓
2. Were all sample holding times met?	✓			✓
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?		✓		
C. QC Samples				
1. Is the blank yield within acceptance criteria?	✓			✓
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			✓
3. Is the blank result < 1/2 the Contract Detection Limit?	✓			✓
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			✓	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?				✓
7. Is the LCS yield within acceptance criteria?	✓			✓
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			✓
9. MS/MSD results and yield meet acceptance criteria?			✓	
10. Duplicate sample results and yield meet acceptance criteria?	✓			✓
D. Other				
1. Are all Nonconformances included and noted?	✓			✓
2. Are all required forms filed out?	✓			✓
3. Correct methodology used?	✓			✓
4. Transcription checked? <u>am 5-12-98</u>	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: _____

Second Level Review: _____

Form #: LS-338.2/96, Rev 4

Date: 5-13-98

Date: 5/15/98

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QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG #: RD-98

Project ID:	BHI	NCM Initiated by:	ADC 58-98
Sample Numbers:	80423801, D0423801		
Tests:	Am241		
Matrix:	Other		W02329

Analytical Area (check appropriate area):

- | | | | |
|--|--------------------------------|--|--|
| <input type="checkbox"/> Sample control | <input type="checkbox"/> GC | <input type="checkbox"/> Wet chemistry | <input checked="" type="checkbox"/> Data review |
| <input type="checkbox"/> Organic preparation | <input type="checkbox"/> HPLC | <input type="checkbox"/> Metals | <input checked="" type="checkbox"/> Radiochemistry |
| <input type="checkbox"/> Inorganic preparation | <input type="checkbox"/> GC/MS | <input type="checkbox"/> Reporting | <input type="checkbox"/> Bioassay |

Nonconformance (check appropriate area):

Holding Time Violations (exceeded by _____ days)

Category I: Laboratory Independent

- ☐ 1. Holding time expired in transit
- ☐ 2. Sample received > 48 hrs. or 1/2 holding time has expired
- ☐ 3. Test added by client after expiration

Category II: Laboratory Dependent

- ☐ 4. Instrument failure
- ☐ 5. Analyst error
- ☐ 6. Login error
- ☐ 7. Miscommunication
- ☐ 8. Other (complete description required)

Category III: Analysis Reruns (QA/QC)

- ☐ 9. Surrogates
- ☐ 10. Internal Standards
- ☐ 11. Spike Recoveries
- ☐ 12. Blank Contamination

Category IV: Analysis Reruns (Confirmation)

- ☐ 13. Second column
- ☐ 14. Contamination check
- ☐ 15. Confirmation of matrix effects
- ☐ 16. Other (complete description required)

Quality Assurance/Quality Control

- ☐ 17. QC data reported outside of controls
- ☐ 18. Incorrect procedure used
- ☐ 19. SOP intentionally modified with QA and Tech. approval
- ☐ 20. Invalid instrument calibration
- ☐ 21. Insufficient sample received for proper analysis

Incorrect or Incomplete Client Deliverable

- ☐ 22. Hardcopy deliverable error
- ☐ 23. Electronic deliverable error

Reported detection limits elevated due to:

- ☐ 24. Sample matrix
- ☐ 25. Insufficient sample volume
- ☐ 26. Other (complete description required)

☒ 27. Other (specify): Reanalysis performed

Comments/Explanation: _____

Notification (check appropriate area):

Client notified by (name and date):	Client's name and response:
<input checked="" type="checkbox"/> in writing <u>CN</u> <input type="checkbox"/> by facsimile	<input type="checkbox"/> process "as is" <input type="checkbox"/> re-sample
<input type="checkbox"/> by telephone <input type="checkbox"/> other (explain)	<input type="checkbox"/> on hold until _____ <input type="checkbox"/> other (explain)

Project Manager (signature and date): [Signature] 5/18/98

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QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

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LOG# RD-98

LOG# RD-98

Corrective Action

Root Cause

Initial and date:

MX 5-8-98

high Am activity in sample causing Am241 to fail through Am243 tracer region of interest resulting in an indeterminate yield.

Corrective Action

Initial and Date:

MX 5-8-98

Reanalysis performed with a reduced sample volume analyzed and an increased tracer activity. Reanalysis data accepted.

Responsibility for performing CA assigned to:

Actions to prevent recurrence

N/A

Initial and Date:

First Level Supervisor:

Joel Kemzema

Date:

5-8-98

Responsible Manager:

Jacqueline Waddell

Date:

5/19/98

Quality Assurance Review

☐ Anomaly

☐ Deficiency

☒ Rerun

☐ Further action required:

Assigned to:

QA signature:

Joelle Ca

Date:

5/20/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason):

N/A

Nonconformance Memo Closure

QA signature/date:

Joelle Ca

5/20/98

0015

**Quezerra Data Review Checklist
RADIOCHEMISTRY**

Work Order number: 804038				
Client ID: BHI				
Due Date: 4-29-98				
Lab Sample Number or SDG: W00329				
Method Test Parameters: Plutonium				
Matrix: Other (liquid)				
	Reactive Item	Yes (✓)	No (✓)	NA (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?				✓
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?		✓		✓
2. Were all sample holding times met?		✓		✓
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?		✓		✓
C. QC Samples				
1. Is the blank yield within acceptance criteria		✓		✓
2. Is the Minimum Detectable Activity for the blank equal to the Contract Detection Limit?		✓		✓
3. Is the blank result < 1/2 the Contract Detection Limit?		✓		✓
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?				✓
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?				✓
6. Is the LCS result within acceptance criteria?		✓		✓
7. Is the LCS yield within acceptance criteria		✓		✓
8. Is the LCS Minimum Detectable Activity < the Contract Detection Limit?		✓		✓
9. MS-MSD results and yield meet acceptance criteria?		✓		✓
10. Duplicate sample results and yield meet acceptance criteria?		✓		✓
D. Other				
1. Are all Nonconformances included and noted?				✓
2. Are all required forms filled out?		✓		✓
3. Correct methodology used?		✓		✓
4. Transcription checked?		✓		✓
5. Were all calculations checked at a minimum frequency?		✓		✓
6. Units correct?		✓		✓

Comments on any "No" response: _____

First Level Review: [Signature]
Second Level Review: [Signature]
Form #: LS-038.2/96, Rev 1

Date: 5-12-98
Date: 5/12/98

Transfer to report these results

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number(s): 804238				
Client ID: BHL				
Due Date: 4-29-98				
Lab Sample Number or SDG: W02329				
Method Test Parameters: Gamma				
Metric: Other				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?	✓			✓
3. Is the sample Minimum Detectable Activity < the Counted Detection Limit?		✓		
C. QC Samples				
1. Is the blank yield within acceptance criteria			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Counted Detection Limit?		✓		
3. Is the blank result < 1/2 the Counted Detection Limit?			✓	
4. Is the blank result > 1/2 the Counted Detection Limit but < Counted Detection Limit?			✓	
5. Is the blank result > the Counted Detection Limit but the sample result < the Counted Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			✓
7. Is the LCS yield within acceptance criteria			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Counted Detection Limit?			✓	
9. MS/MSD results and yield meet acceptance criteria?			✓	
10. Duplicate sample results and yield meet acceptance criteria?	✓			✓
D. Other				
1. Are all Nonconformances included and noted?			✓	
2. Are all required forms filed out?			✓	
3. Correct methodology used?	✓			✓
4. Transcription checked?	✓			
5. Were all calibrations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: _____

John M. Conner

Date: _____

4-28-98

Second Level Review: _____

WHA

Date: _____

4/29/98

Form #: LS-038.2/96, Rev 4

Report BHL 5 + Am 241 HP, Ra226 DA

0017

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number (st): 804238				
Client ID: BNI				
Due Date: 4-29-98				
Lab Sample Number or SDG: W02329				
Method Test Parameters: Alpha				
Matrix: Other				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?				✓
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓	✓		✓
C. QC Samples				
1. Is the blank yield within acceptance criteria?			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓	✓		
3. Is the blank result < 1/2 the Contract Detection Limit?	✓			✓
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			✓	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			✓
7. Is the LCS yield within acceptance criteria?			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?		✓		✓
9. MS/MSD results and yield meet acceptance criteria?			✓	
10. Duplicate sample results and yield meet acceptance criteria?	✓			✓
D. Other				
1. Are all Nonconformances included and noted?			✓	
2. Are all required forms filed out?				✓
3. Correct methodology used?	✓			✓
4. Transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response:

First Level Review:

Second Level Review:

Form #: LS-038.2 /96, Rev 4

Date:

Date:

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

"Reanalysis"

Work Order number (s): <u>804238</u>				
Client ID: <u>BNI</u>				
Due Date: <u>4-29-98</u>				
Lab Sample Number or SDG: <u>W02329</u>				
Method Test Parameters: <u>Beta</u>				
Matrix: <u>Other (Liquid)</u>				
Review Item	Yes (✓)	No (✓)	NA (✓)	2 nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?	✓			✓
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?	✓			✓
C. QC Samples				
1. Is the blank yield within acceptance criteria			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			✓
3. Is the blank result < 1/2 the Contract Detection Limit?	✓			✓
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			✓	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓			✓
7. Is the LCS yield within acceptance criteria			✓	
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			✓
9. MS/MSD results and yield meet acceptance criteria?			✓	
10. Duplicate sample results and yield meet acceptance criteria?	✓			✓
D. Other				
1. Are all Nonconformances included and noted?	✓			✓
2. Are all required forms filed out?	✓			✓
3. Correct methodology used?	✓			✓
4. Transcription checked? <u>DM 4-28-98</u>	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response: _____

First Level Review: _____

Date: 4-28-98

Second Level Review: _____

Date: 4/29/98

Form #: LS-038.2 /96/ Rev. 4

0019

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 of 2

LOG #: RD-98-

Project ID: <u>BHI</u>		NCM Initiated by: <u>MEZ</u>	
Sample Numbers: <u>80423801, D0423801</u>		<u>J0423818, JS</u>	
Tests: <u>Beta</u>			
Matrix: <u>Other</u>		<u>W02329</u>	

Analytical Area (check appropriate area):

<input type="checkbox"/> Sample control	<input type="checkbox"/> GC	<input type="checkbox"/> Wet chemistry	<input checked="" type="checkbox"/> Data review
<input type="checkbox"/> Organic preparation	<input type="checkbox"/> HPLC	<input type="checkbox"/> Metals	<input checked="" type="checkbox"/> Radiochemistry
<input type="checkbox"/> Inorganic preparation	<input type="checkbox"/> GC/MS	<input type="checkbox"/> Reporting	<input type="checkbox"/> Bioassay

Nonconformance (check appropriate area):

<p>Holding Time Violations (exceeded by _____ days)</p> <p><i>Category I: Laboratory Independent</i></p> <p><input type="checkbox"/> 1. Holding time expired in transit</p> <p><input type="checkbox"/> 2. Sample received > 48 hrs. or 1/2 holding time has expired</p> <p><input type="checkbox"/> 3. Test added by client after expiration</p> <p><i>Category II: Laboratory Dependent</i></p> <p><input type="checkbox"/> 4. Instrument failure</p> <p><input type="checkbox"/> 5. Analyst error</p> <p><input type="checkbox"/> 6. Login error</p> <p><input type="checkbox"/> 7. Miscommunication</p> <p><input type="checkbox"/> 8. Other (complete description required)</p> <p><i>Category III: Analysis Reruns (QA/QC)</i></p> <p><input type="checkbox"/> 9. Surrogates</p> <p><input type="checkbox"/> 10. Internal Standards</p> <p><input type="checkbox"/> 11. Spike Recoveries</p> <p><input type="checkbox"/> 12. Blank Contamination</p> <p><i>Category IV: Analysis Reruns (Confirmation)</i></p> <p><input type="checkbox"/> 13. Second column</p> <p><input type="checkbox"/> 14. Contamination check</p> <p><input type="checkbox"/> 15. Confirmation of matrix effects</p> <p><input type="checkbox"/> 16. Other (complete description required)</p>	<p>Quality Assurance/Quality Control</p> <p><input type="checkbox"/> 17. QC data reported outside of controls</p> <p><input type="checkbox"/> 18. Incorrect procedure used</p> <p><input type="checkbox"/> 19. SOP intentionally modified with QA and Tech. approval</p> <p><input type="checkbox"/> 20. Invalid instrument calibration</p> <p><input type="checkbox"/> 21. Insufficient sample received for proper analysis</p> <p>Incorrect or Incomplete Client Deliverable</p> <p><input type="checkbox"/> 22. Hardcopy deliverable error</p> <p><input type="checkbox"/> 23. Electronic deliverable error</p> <p>Reported detection limits elevated due to:</p> <p><input type="checkbox"/> 24. Sample matrix</p> <p><input type="checkbox"/> 25. Insufficient sample volume</p> <p><input type="checkbox"/> 26. Other (complete description required)</p> <p><input checked="" type="checkbox"/> 27. Other (specify): <u>reanalysis performed</u></p> <p>Comments/Explanation: _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
---	---

Notification (check appropriate area):

<p>Client notified by (name and date): _____</p> <p><input checked="" type="checkbox"/> in writing <u>CN</u></p> <p><input type="checkbox"/> by telephone</p> <p><input type="checkbox"/> by facsimile</p> <p><input type="checkbox"/> other (explain)</p>	<p>Client's name and response: _____</p> <p><input type="checkbox"/> process "as is"</p> <p><input type="checkbox"/> on hold until _____</p> <p><input type="checkbox"/> re-sample</p> <p><input type="checkbox"/> other (explain)</p>
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Project Manager (signature and date): Am 4/29/95

0020

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 2 OF 2

LOG#: RD-92

Corrective Action

Root Cause

Initial and date:

initial analysis duplicate agreement is unacceptable
at 110% RPD

Corrective Action

Initial and Date:

reanalysis results accepted within acceptance
criteria

Responsibility for performing CA assigned to:

Actions to prevent recurrence

Initial and Date:

N/A

First Level Supervisor:

Date:

Responsible Manager:

Date:

Quality Assurance Review

☐ Anomaly

☐ Deficiency

☒ Rerun

☐ Further action required:

Assigned to:

QA signature:

Date:

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason):

N/A

Nonconformance Memo Closure

QA signature/date:

Jodie Co. 5/20/98

0021

CHAIN OF CUSTODY FORMS

Bechtel Hanford Inc.		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				B98-068-05		Page <u>1</u> of <u>1</u>					
Collector <i>Doug Bryant</i>		Company Contact <i>DAVE ENCKE</i>		Telephone No.		Project Coordinator TRENT, SJ		Data Turnaround 15 Days					
Project Designation 233-S Plutonium Concentration Facility Process Areas - Ot		Sampling Location <i>233-S</i>				SAF No. B98-068							
Ice Chest No. <i>SMC-286</i>		Field Logbook No.				Method of Shipment <i>Gov Vehicle</i>							
Shipped To Quanterra Incorporated		Offsite Property No. <i>N/A</i>				Bill of Lading/Air Bill No. <i>N/A</i>							
Waste Designation Client determined no waste codes associated with this project.						COA							
POSSIBLE SAMPLE HAZARDS/REMARKS				Preservation		None	None	None	None				
				Type of Container		<i>QOP</i>	<i>QOP</i>	<i>QOP</i>	<i>QOP</i>				
				No. of Container(s)		<i>25</i>	<i>1</i>	<i>25</i>	<i>25</i>				
				Volume		200ml	200ml	200ml	1000ml				
Special Handling and/or Storage													
SAMPLE ANALYSIS <i>80423801</i> <i>SDG</i> <i>W02329</i>				Americium-241/Curium-244	Gross Alpha, Gross Beta	Isotopic Plutonium	See item (I) in Special Instructions						
Sample No.		Matrix *		Sample Date	Sample Time								
BONKH3		Other Liquid		<i>4-14-98</i>	<i>1040</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>				
CHAIN OF POSSESSION		Sign/Print Names				SPECIAL INSTRUCTIONS (1) Gamma Spectroscopy (Americium-241, Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155, Radium-226) <i>All of Sample Volume in one container. Sample Volume = 25 mL.</i>							
		Relinquished By <i>Doug Bryant</i>		Date/Time <i>4-14-98</i>						Received By <i>David Henning</i>		Date/Time <i>4-14-98</i>	
		Relinquished By		Date/Time						Received By <i>L. Ock</i>		Date/Time	
		Relinquished By		Date/Time						Received By		Date/Time	
LABORATORY SECTION		Received By				Title							
		Disposal Method				Disposed By							
FINAL SAMPLE DISPOSITION													

Matrix *

- S = Soil
- SE = Sediment
- SO = Solid
- SL = Sludge
- W = Water
- U = Oil
- A = Air
- DS = Drum Solids
- DL = Drum Liquids
- T = Tissue
- WI = Wipe
- L = Liquid
- V = Vegetation
- X = Other

0023

RADIOACTIVE
SHIPMENT RECORD

1009153

Page 1 of 2

Company BHI Hanford
Address 1335 West ALEA
City, State, Zip Richland WA 99352
Contact David ST John / Doug Bryant
Phone 509-376-8540 / 509-376-8273

Ship ☒ Prepaid ☐ Collect
Via ☒ Motor ☐ Air Psgr ☐ UPS
☐ Rail ☐ Air Cargo ☐ Site Carrier

SHIPMENT AUTHORIZATION NUMBER

2. SHIP TO
Company Quantenna
Address 2800 GER WASH WAY
City, State, Zip Richland WA 99352
Attention KAREN Actenberg
Phone 509-375-3131 EXT 135

Markings Applied

Radioactive - LSA ☐
Radioactive - SCO ☐
Type A ☐
Type B with trefoil ☐

LSA Description

LSA-I ☐
LSA-II ☐
LSA-III ☐
SCO-I ☐
SCO-II ☐

Labels Applied

Empty ☐
Radioactive White - I ☐
Radioactive Yellow - II ☐
Radioactive Yellow - III ☐
Subsidiary Hazard ☐

For Normal Form only

Identify

Physical Form ☒ Liquid ☐ Gas
☐ Solid
Chemical Form ☒ Elemental
☐ Metal ☐ Nitrate
☐ Oxide ☐ Mixture
☐ Other

EMERGENCY RESPONSE

Telephone 509-373-3800

Emergency Response Guide(s)

161Highway Route Controlled Quantity ☐Exclusive Use Shipment ☐with instructions ☐Placards Applied ☐If Rail Specify: ☐Fissile Excepted, Grams < 300 ☒Excepted Package Statement ☒

5. HM Proper Shipping Name: Radioactive Material

☐ excepted package - empty packaging 7 UN2910
☐ excepted package - instruments or articles 7 UN2910
☒ excepted package - limited quantity of material 7 UN2910
☐ excepted package - articles manufactured from natural or depleted uranium or natural thorium 7 UN2910
☐ Special Form, n.o.s. 7 UN2974
☐ Low Specific Activity, n.o.s. 7 UN2912
☐ n.o.s. 7 UN2982
☐ Fissile, n.o.s. 7 UN2918
☐ Surface Contaminated Object 7 UN2913

Warning - Fissile Material Controlled Shipment. Do Not Load More Than N/A Packages Per Vehicle. In Loading and Storage Areas, Keep at least 20 Feet From Other Packages Bearing Radioactive Labels.

11.	No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes	T.I.	Bq/Package	Gr. Wt. Kg.
	1	Strongtight	N/A	N/A	TAPE	PU-239/240, Am241	N/A	522x10 ⁶	101.2
									21 kg
									21 kg
									21 kg

(Shipper may describe package in detail on one of the unused lines above)

TOTALS N/A 522x10⁶ 101.2

12. This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Certifier's Signature David Stephen On behalf of DOE-RL Date 04/13/98 Organization ERC - AFS Complete Cost Code (Inc. End Function) DB 2250
SAFE 398-068

13. Surface Dose Rate of Package ☒ < 0.005 or _____ mSv/hr
Dose Rate @ 1 Meter from Surface of Package ☒ < 0.005 or _____ mSv/hr
Smears of Outer Container ☐ < 0.41 Bq (22 dpm) β & γ /cm²
☐ < 0.04 Bq (2.2 dpm) α /cm²
☒ < Tbl. 2.2 HSRM Onsite Limits
Additional Data and Instructions (inc. Readings on Internal Packaging)
Signature - Radiation Monitoring Andy

TRUCK LOAD OR EXCLUSIVE USE

Surface ☒ < 2 mSv/hr (200 mrem/hr)
@ 2 meters ☒ < 0.1 mSv/hr (10 mrem/hr)
@ Cab ☒ < 0.02 mSv/hr (2 mrem/hr) or sleeper (Using N+B γ)

Bldg. 7335 Survey No. 2335-18-045 Date 4/14/98

14. TRANSPORTER
Vehicle Number 663-23803 DRIVER SIGNATURE Doug Bryant
RECEIVER SIGNATURE Karen Actenberg Date 4-14-98

15. OFFSITE AUTHORIZATION
Shipment has been inspected and verified to be in compliance with DOT regulations
Authorized Signature M. J. Sams Printed Name M. J. Sams Date 4-15-98

16. AUTHORIZATION FOR SHIPMENT
AIR TRANSPORT CERTIFICATION ☐ N/A
CARGO AIRCRAFT ☐ Cargo Aircraft Only Labels Applied
PASSENGER AIRCRAFT ☐ Ltd Qty ☐ Research/Medical Diagnosis ☐ Human Medical Research
Pkg. Dimensions (cm) N/A

17. OFFSITE AUTHORIZATION
Tracking No. RM BH 2408 Date Shipped 4-14-98 Routing CHZM ETA 4-16-98
Surveyed By N/A Date N/A Approved for Shipment Offsite M. J. Sams Date 4-15-98

GAMMA-RAY ENERGY ANALYSIS REPORT
 Thermo Hanford Inc.
 Radiological Counting Facility

THI - RCF

For Sample
 BOKH3

Project 233-S
 Customer ID BOKH2 Solution
 RCF ID RCF3087
 Sample time, date 4/6/98
 Analysis date 4/8/98

Isotope	Activity pCi/gm	2 s err	Ci/gm
K40	< 3.7e+00		3.7e-12
Co60	< 8.1e-01		8.1e-13
H129	< 8.6e+01		8.6e-11
Cs137	< 1.0e+00		1.0e-12
Eu152	< 2.4e+00		2.4e-12
Eu154	< 2.3e+00		2.3e-12
Eu155	< 1.8e+00		1.8e-12
Th232dau	< 2.8e+00		2.8e-12
U235	< 3.7e+00		3.7e-12
U238	< 5.6e+01		5.6e-11
U238dau	< 1.1e+00		1.1e-12
Np237	< 7.8e-01		7.8e-13
Am241	1.2e+04 +/- 3.6e+02		1.2e-08
Tot Act Gam (pCi/gm)	1.2e+04	Ci/gm	1.2e-08

Y/Sr-90 < N/R
 Gross Alpha 3.0e+04 +/- 3.0e+03 3.0e-08
 Gross Beta 3.2e+03 +/- 4.5e+02 3.2e-09 Reported as 137-Cs Betas.
 AEA total 3.5e+04 +/- 3.5e+03

Total Activity (pCi/gm) 3.8e+04
 (Ci/gm) 3.8e-08

239/240-Pu 2.6E+04
 241-Am 1.3E+04

Definitions:

All errors reported at 2 standard deviations
 A Assigned as residual beta from Gamma/Beta balance.
 For soils and natural samples, the following applies.
 The analysis of U238 is based on the activity of Pa234m

The analysis of Np237 is based on the activity of Pa233

U238dau is the activity of Pb214 and Bi214, short lived daughter products of U238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th232dau is the activity of Ac228, Pb212, and Tl208, short lived daughter products of 232Th. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

N/R means no result or analysis not requested.

J. L. Ruff 4/9/98
 Radiological analyst Date

Albert I. Davis 4/9/98
 Radiological Manager Date

Post-it® Fax Note 7671		Date 4/9	Page 1
To Doug Bergant, Durschler	From A. I. Davis		
Co/Dex:	Ca:		
Phone # 573-6462	Phone # 373-9731		
Fax # 376-8851	Fax #		

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 4-14-98 1430 SG#: W02329

Work Order Number: 804238 SAF #: B98-068

Shipping Container ID: SML-76 Chain of Custody #: B98-068-05

1. Custody Seals on shipping container intact? Yes [☒] No [☐
2. Custody Seals dated and signed? Yes [☒] No [☐
3. Chain-of-Custody record present? Yes [☒] No [☐
4. Cooler temperature 4°C
5. Vermiculite/packing materials is Wet [☐] Dry [☒
6. Number of samples in shipping container: 1
7. Sample holding times exceeded? Yes [☐] No [☒

8. Samples have:
- | | |
|---|--|
| <input checked="" type="checkbox"/> tape | <input type="checkbox"/> hazard labels |
| <input checked="" type="checkbox"/> custody seals | <input type="checkbox"/> appropriate sample labels |

9. Samples are:
- | | |
|---|---|
| <input checked="" type="checkbox"/> in good condition | <input type="checkbox"/> leaking |
| <input type="checkbox"/> broken | <input type="checkbox"/> have air bubbles |

10. Where any anomalies identified in sample receipt? Yes [☐] No [☒
11. Description of anomalies (include sample numbers): _____

Sample Custodian/Laboratory: Larry B. Bunting Date: 4-14-98

Telephoned To: _____ On _____ By _____

DUE DATE 4-24-98

*** REANALYSIS REQUEST ***
CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

CUSTOMER BHT

ANALYSIS Am 241

MATRIX Other (liquid)

SAMPLE DELIVERY GROUP W02329

BATCH NUMBER _____

PC/L / 20 dpm tracer / please analyze 1/4 ml

LAB SAMPLE ID	ESJAC870 DATE 01/01/98	ESJAC880 DATE 01/01/98	COMMENTS Sa anal(1)
1) 80423801			0.0000027
2) 80423801	ESJAC881 DATE 01/01/98	ESJAC882 DATE 01/01/98	0.0000031
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			
12)			
13)			
14)			
15)			
16)			
17)			
18)			
19)			
20)			

LAB QC ID	ESJAC870 DATE 01/01/98	ESJAC880 DATE 01/01/98	
BLANK) 80423825			0.2
SPIKE) 80423825	IQ0197 DATE 01/01/98		0.2
PK 4-30-98			

ACTIONS (Initial & Date)

1) INITIATED
SOP(S) #

PK 4-30-98
RICHRC0002 fw2

4) SEPARATION LAB RECEIVED 5498 K
SOP(S) # RL5057
Copy of 5-8-98 RICHRC5003.1

2) PREP LAB RECEIVED
SOP(S) #

4-30-98 OK
RICHRC5006-1

5) COUNTING/MEASUREMENT
LAB RECEIVED
SOP(S) #

3) SAMPLE REMAINDER STORED
SOP(S) #

4-30-98 OK
W

6) DATA REVIEWED AND
ANALYTICAL PREP STORED PK 5-8-98
SOP(S) # RICHRC0002 fw2

RPT units = pCi/L
at time = 200
at inst = Asper

DUE DATE 4-29-98

2nd *** REANALYSIS REQUEST ***
CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

CUSTOMER BHI

ANALYSIS Pu30

MATRIX Other Liquid

SAMPLE DELIVERY GROUP W02329

pci/L
20 gpm tracer

1/4 ml of dilution
500 min Ct time

BATCH NUMBER _____

LAB SAMPLE ID	ICH5024	ID	COMMENTS	sa anal (-)
1) <u>80423801</u>	<u>204713 21.4703</u>			<u>2.7xe-6</u>
2) <u>D0423801</u>	<u>ICH5023</u>			<u>2.7xe-6</u>
3)	<u>204713 21.4703</u>			
4)				
5)				
6)				
7)				
8)				
9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				

LAB QC ID	ICH5024	ID	COMMENTS	sa anal (-)
BLANK) <u>J042383B</u>	<u>204713 21.4703</u>			<u>C-2</u>
SPIKE) <u>J042383S</u>	<u>ICH5023</u>			<u>C-2</u>
	<u>204713 21.4703</u>			

ACTIONS (Initial & Date)

1) INITIATED
SOP(S) #

JPK 5-12-98
RICHARD COOZ 6012

4) SEPARATION LAB RECEIVED 05/14/98
SOP(S) # RICHARD 5010

2) PREP LAB RECEIVED
SOP(S) #

5-13-98
RICHARD 50167

5) COUNTING/MEASUREMENT
LAB RECEIVED 5/15/98
SOP(S) # RICHARD 5015

3) SAMPLE REMAINDER STORED
SOP(S) #

5-13-98
14

6) DATA REVIEWED AND
ANALYTICAL PREP STORED
SOP(S) #

5/18/98
RICHARD COOZ 6012

Ct time = 500
RPT units = pci/L

ED 05/15/98 Data call - 7/15/98 RICHARD 5015
RICHARD 5039

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

15-Apr-1998

Page 1

Due
4-29-98

CUSTOMER: BHI

B98-068

SAMPLE DELIVERY GROUP

W02329

MATRIX : OTHER

BATCH NUMBER

04-238

QES ID	DUP	ACCOUNT	CUSTOMER ID	SA ANM (C)	COMMENTS
J042381B	Ref Dnk	17 APR 98 1600	25	GER 4	18 APR 98 1235 OK
J042381S	BHSC001	07 MAY 97 1200	25	GER 6	18 APR 98 1234 OK
1) B0423801	14 APR 98	1040 BHI	BONKH3	0.2501	GER 3 18 APR 98 1239 OK
D0423801	14 APR 98	1040		0.2504	GER 7 18 APR 98 1316 OK

ACTIONS (Initial & Date)

1) INITIATED

SOP(S) #

4/15/98
RD 2800

5) COUNTING/MEASUREMENT LAB

SOP(S) #

OK 4/18/98
RICHRD0007 Rev 1

2) PREP LAB RECEIVED

SOP(S) #

4-17-98 OK
RCHRC00017-1

6) DATA REVIEWED AND ANALYTICAL PREP STORED

SOP(S) #

APC4-28-98
RICHRD0002
REV 2

3) SAMPLE REMAINDER STORED

SOP(S) #

4-17-98 OK
N/A

4) SEPARATION LAB RECEIVED

SOP(S) #

SA appears to be water

Reduced aliquot: CAT III

RPT units = pCi/g

ct time = 50

CT INSTR = GER

GEO = 25

Yadda
Am 241 HP
Raz 6

CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

15-Apr-1998
Page 1

Due
4-29-98

CUSTOMER: BHI

SAMPLE DELIVERY GROUP

W02329

MATRIX : OTHER

B98-068

BATCH NUMBER

04-238

GES ID	DUP	ACCOUNT	CUSTOMER ID	PPTWT (mg)	COMMENTS	
J042381B	10.0591	0.092391/1		0.2	18APR98 0848	10A 6
J042381S	EQEG1814					
	Pr. 9/29/97 EX. 9/29/98	1		0.6		10B
1) 80423801		BH1a0104 BONKH3		0.3		10C
D0423801		0.0103		0.2		10D

ACTIONS (Initial & Date)

1) INITIATED

SOP(S) #

4/15/98
RD0000

5) COUNTING/MEASUREMENT LAB

SOP(S) #

RD 4/15/98
RICHARDSON 3

2) PREP LAB RECEIVED

SOP(S) #

4-17-98 DR
RK#RCS014-D
RK#RCS014-1

6) DATA REVIEWED AND

ANALYTICAL PREP STORED

SOP(S) #

4/28-98
RICHARDSON

3) SAMPLE REMAINDER STORED

SOP(S) #

4-17-98 DR
1A

4) SEPARATION LAB RECEIVED

SOP(S) #

ALIQ REDUCED: CAT III

DISH SIZE 1.5

RPT UNITS *pci/g*

PROC 3009

Sug alia *DIRECT*

ct time 50

SA appears to be water

DUE DATE 4/29/98

*** REANALYSIS REQUEST ***
CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

CUSTOMER BHI

ANALYSIS Beta

MATRIX Other (liquid)

SAMPLE DELIVERY GROUP _____

Cat III

BATCH NUMBER _____

PC/L
use 1/4 g for 50 min ct time
42398

LAB SAMPLE ID	CUSTOMER ID	COMMENTS
1) <u>80423801</u>	<u>0.1</u>	<u>0.00028</u> <u>26C</u> <u>25 APR 98</u> <u>OP</u>
2) <u>00423801</u>	<u>0.2</u>	<u>0.00027</u> <u>26D</u> <u>1</u> <u>1</u>
3)		
4)	<u>ppt wt</u>	<u>SA ANAL</u>
5)	<u>(mg)</u>	<u>(L)</u>
6)		
7)		
8)		
9)		
10)		
11)		
12)		
13)		
14)		
15)		
16)		
17)		
18)		
19)		
20)		

LAB QC ID	COMMENTS
BLANK) <u>5042382B</u>	<u>0.1</u> <u>0.2</u> <u>26A</u> <u>25 APR 98</u> <u>OP</u>
SPIKE) <u>5042382J</u>	<u>0.2</u> <u>26B</u> <u>1</u> <u>1</u>
	<u>0.6</u>

30.090 ± 0.37552 dpm
ACTIONS (Initial & Date)

1) INITIATED
SOP(S) # _____

7/16/4-23-98
RICHARDSON

4) SEPARATION LAB RECEIVED
SOP(S) # _____

2) PREP LAB RECEIVED
SOP(S) # _____

4-24-98
RICHARDSON

5) COUNTING/MEASUREMENT
LAB RECEIVED 4/28/98
SOP(S) # 725/4100

3) SAMPLE REMAINDER STORED
SOP(S) # _____

4-24-98
W

6) DATA REVIEWED AND
ANALYTICAL PREP STORED
SOP(S) # _____

7/16/4-23-98
RICHARDSON

DISH size = 1.5
P/R = 3009

RPT UNITS = PC/L

ct time = 50

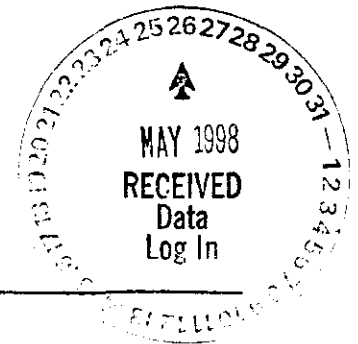
Sub ALQ = ABSORBER

**CERTIFICATE OF ANALYSIS
SDR FOR SAMPLE BONKH3**

Bechtel Hanford, Inc.
3350 George Washington Way
Richland, WA 99352

May 26, 1998

Attention: Joan Kessner



SAF Number	:	B98-068
Date First Sample Received	:	April 14, 1998
Number of Samples	:	One (1)
Sample Type	:	Other-Liquid
SDG Number	:	W02329A
Data Deliverable	:	15 Day Priority/21 Day Summary

I. Introduction

On April 14, 1998, one 15-day TAT "other" sample was received by the Quanterra Environmental Services Richland Laboratory (QESRL) for radiochemical and chemical analysis. An additional request for Np-237 analysis on a seven day TAT for this sample was initiated on 4/27/98 by Steve Trent. Upon receipt, the sample was assigned the following laboratory ID number to correspond with the Bechtel Hanford, Inc. (BHI) specific ID:

<u>QESRL ID#</u>	<u>BHI ID#</u>	<u>MATRIX</u>	<u>DATE OF RECEIPT</u>
80448601	BONKH3	Other-Liquid	4/14/98

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were: **Alpha Spectroscopy**
 Neptunium-237 by method RC-5064

0002

Bechtel Hanford, Inc.
May 26, 1998
Page 2

III. Quality Control

The analytical results for each analysis performed under SDG W02329A include a minimum of one Laboratory Control Sample (LCS), one method (reagent) blank, and one duplicate. Any exceptions have been noted in the "Comments" section.

Quality control sample results are reported in the same units as sample results.

IV. Comments

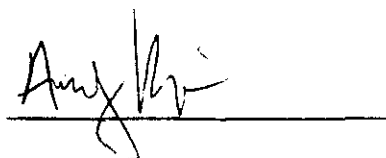
Alpha Spectroscopy

Neptunium-237 by method RC-3208

The initial Np-237 analysis was performed without an MS and the LCS recoveries were low at 45.2% and 52.59%. In addition, the RPD was at 35%. Therefore, a reanalysis was performed. The LCS, batch blank, MS, duplicate sample (B0NKH3) and sample results are within contractual requirements. There was a second LCS analyzed that was slightly low at 69.2%

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager or a designee, as verified by the following signature.

Reviewed and approved:



Andy Kopriva
Project Manager

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland SDG: /RPT GRP: W02329A/ 5212
LAB SAMPLE ID: 80448601 MATRIX: OTHER
CLIENT ID: BONKH3 DATE RECEIVED: 4/27/1998 12:00:00 PM

ANALYTE	RESULT	Q	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA/IDL	REPORT UNIT	YIELD	METHOD NUMBER
NP-237	0.00E+00	U	0.0E+00	0.0E+00	2.10E+03	pCi/L	100.00%	RICHRC5064

Number of Results: 1

**Quanterra Data Review Checklist
RADIOCHEMISTRY**

Work Order number/sr: <u>804486</u>				
Client ID: <u>BHI</u>				
Due Date: <u>4-29-98</u>				
Lab Sample Number of SDG: <u>W0.2329A</u>				
Method Test Parameters: <u>Np237</u>				
Matrix: <u>Other Liquid</u>				
Review Item	Yes (✓)	No (✓)	N/A (✓)	2nd Level Review (✓)
A. Calibration				
1. Is the calibration documentation included where applicable?			✓	
B. Sample Analysis				
1. Are the sample yields within acceptance criteria?			✓	
2. Were all sample holding times met?	✓			✓
3. Is the sample Minimum Detectable Activity < the Contract Detection Limit?		✓		
C. QC Samples				
1. Is the blank yield within acceptance criteria			✓	
2. Is the Minimum Detectable Activity for the blank result ≤ the Contract Detection Limit?	✓			✓
3. Is the blank result < 1/2 the Contract Detection Limit?	✓			✓
4. Is the blank > 1/2 the Contract Detection Limit but < Contract Detection Limit?			✓	
5. Is the blank result > the Contract Detection Limit but the sample result < the Contract Detection Limit?			✓	
6. Is the LCS result within acceptance criteria?	✓	✓	✓	✓
7. Is the LCS yield within acceptance criteria			✓	✓
8. Is the LCS Minimum Detectable Activity ≤ the Contract Detection Limit?	✓			✓
9. MS/MSD results and yield meet acceptance criteria?	✓		✓	✓
10. Duplicate sample results and yield meet acceptance criteria?	✓			✓
D. Other				
1. Are all Nonconformances included and noted?	✓			✓
2. Are all required forms filed out?	✓			✓
3. Correct methodology used?	✓			✓
4. Transcription checked?	✓			
5. Were all calculations checked at a minimum frequency?	✓			
6. Units checked?	✓			✓

Comments on any "No" response:

First Level Review:

John T. Kengema

Date:

5-26-98

Second Level Review:

APR

Date:

5/26/98

Form #: LS-038.7/96, Rev. 4

Transfer & report these reanalysis results

0010

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG # RD-98-

Project ID: <u>BHI</u>		NCM Initiated by: <u>MC-5-26-98</u>	
Sample Numbers: <u>J0448635, 80448601, D0448601, W0448601</u>			
Tests: <u>Np237</u>			
Matrix: <u>Other Liquid</u>			
Analytical Area (check appropriate area):			
<input type="checkbox"/> Sample control	<input type="checkbox"/> GC	<input type="checkbox"/> Wet chemistry	<input checked="" type="checkbox"/> Data review
<input type="checkbox"/> Organic preparation	<input type="checkbox"/> HPLC	<input type="checkbox"/> Metals	<input checked="" type="checkbox"/> Radiochemistry
<input type="checkbox"/> Inorganic preparation	<input type="checkbox"/> GC/MS	<input type="checkbox"/> Reporting	<input type="checkbox"/> Bioassay
Nonconformance (check appropriate area):			
Holding Time Violations (exceeded by _____ days) <i>Category I: Laboratory Independent</i> <input type="checkbox"/> 1. Holding time expired in transit <input type="checkbox"/> 2. Sample received > 48 hrs. or 1/2 holding time has expired <input type="checkbox"/> 3. Test added by client after expiration <i>Category II: Laboratory Dependent</i> <input type="checkbox"/> 4. Instrument failure <input type="checkbox"/> 5. Analyst error <input type="checkbox"/> 6. Login error <input type="checkbox"/> 7. Miscommunication <input type="checkbox"/> 8. Other (complete description required) <i>Category III: Analysis Reruns (QA/QC)</i> <input type="checkbox"/> 9. Surrogates <input type="checkbox"/> 10. Internal Standards <input type="checkbox"/> 11. Spike Recoveries <input type="checkbox"/> 12. Blank Contamination <i>Category IV: Analysis Reruns (Confirmation)</i> <input type="checkbox"/> 13. Second column <input type="checkbox"/> 14. Contamination check <input type="checkbox"/> 15. Confirmation of matrix effects <input type="checkbox"/> 16. Other (complete description required)		Quality Assurance/Quality Control <input type="checkbox"/> 17. QC data reported outside of controls <input type="checkbox"/> 18. Incorrect procedure used <input type="checkbox"/> 19. SOP intentionally modified with QA and Tech. approval <input type="checkbox"/> 20. Invalid instrument calibration <input type="checkbox"/> 21. Insufficient sample received for proper analysis Incorrect or Incomplete Client Deliverable <input type="checkbox"/> 22. Hardcopy deliverable error <input type="checkbox"/> 23. Electronic deliverable error Reported detection limits elevated due to: <input checked="" type="checkbox"/> 24. Sample matrix <u>extremely high screening activity</u> <input type="checkbox"/> 25. Insufficient sample volume <input type="checkbox"/> 26. Other (complete description required) <input checked="" type="checkbox"/> 27. Other (specify): <u>J0448635, LCS recovery 69.2%</u>	
		Comments/Explanation: _____ _____ _____ _____ _____	
Notification (check appropriate area):			
Client notified by (name and date): _____		Client's name and response: _____	
<input checked="" type="checkbox"/> in writing	<input type="checkbox"/> by facsimile	<input type="checkbox"/> process "as is"	<input type="checkbox"/> re-sample
<input type="checkbox"/> by telephone	<input type="checkbox"/> other (explain)	<input type="checkbox"/> on hold until _____	<input type="checkbox"/> other (explain)
Project Manager (signature and date): <u>AM</u>		<u>5/26/98</u>	

0011

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 2 OF 2

5-10-1998

LOG#: RD-98-

Corrective Action

Root Cause

Initial and date:

NR 5-26-98

① LCS low bias because there is no tracer for yield correction.

② MPASD RDL due to reduced sample volume analyzed because of high screening activity.

Corrective Action

Initial and Date:

NR 5-26-98

Data accepted, 2nd LCS (50448645) recovery 73%
Other QC (blank + MS) acceptable

Responsibility for performing CA assigned to:

Actions to prevent recurrence

N/A

Initial and Date:

First Level Supervisor:

[Signature]

Date:

5-26-98

Responsible Manager:

[Signature]

Date:

5/26/98

Quality Assurance Review

☒ Anomaly

☐ Deficiency

☐ Rerun

☐ Further action required:

Assigned to:

[Signature]

QA signature:

Date:

5/26/98

Corrective Action Verification

☐ Verified

☐ Cannot Verify (specify reason):

N/A

Nonconformance Memo Closure

QA signature/date:

[Signature] 5/26/98

0012

CHAIN OF CUSTODY FORMS

Bechtel Hanford Inc.		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST				B98-068-05		Page 1 of 1	
Collector <i>Dee Bryant</i>		Company Contact <i>DAVE EICK</i>		Telephone No.		Project Coordinator Trent, SJ		Data Turnaround 15 Days	
Project Designation 233-S Plutonium Concentration Facility Process Areas - Ot		Sampling Location <i>233-S</i>				SAF No. B98-068			
Ice Chest No. <i>SMC -286</i>		Field Logbook No.				Method of Shipment <i>Gov Vehicle</i>			
Shipped To Quanterra Incorporated		Offsite Property No. <i>N/A</i>				Bill of Lading/Air Bill No. <i>N/A</i>			
Waste Designation Client determined no waste codes associated with this project.						COA			

POSSIBLE SAMPLE HAZARDS/REMARKS <div style="font-size: 2em; font-family: cursive;">80448601-NP237</div>	Preservation	None	None	None	None						
	Type of Container	<i>GP</i>	<i>GP</i>	<i>GP</i>	<i>GP</i>						
	No. of Container(s)	<i>250</i>	<i>1</i>	<i>250</i>	<i>250</i>						
	Special Handling and/or Storage	Volume	200ml	200ml	200ml	1000ml					

SAMPLE ANALYSIS <div style="font-size: 1.5em; font-family: cursive;">80423801 W02329</div>				Americium-241/Curium-244	Gross Alpha, Gross Beta	Isotopic Plutonium	See item (1) in Special Instructions						
---	--	--	--	--------------------------	-------------------------	--------------------	--------------------------------------	--	--	--	--	--	--

Sample No.	Matrix *	Sample Date	Sample Time								
BONKH3	Other Liquid	4-14-98	1040	X	X	X	X				

CHAIN OF POSSESSION	Sign/Print Names				SPECIAL INSTRUCTIONS				Matrix *
Relinquished By <i>Dee Bryant</i>	Date/Time <i>4-14-98</i>	Received By <i>James H. Hinkle</i>	Date/Time <i>4-14-98</i>	(1) Gamma Spectroscopy (Americium-241, Cesium-137, Cobalt-60, Europium-152, Europium-154, Europium-155, Radium-226) <i>All of Sample Volume in one container. Sample Volume ≈ 25 mL.</i>				S - Soil SE - Sediment SO - Solid SL - Sludge W - Water O - Oil A - Air DS - Drum Solids DL - Drum Liquids T - Tissue WI - Wipe L - Liquid V - Vegetation X - Other	
Relinquished By	Date/Time	Received By	Date/Time						
Relinquished By	Date/Time	Received By	Date/Time						
Relinquished By	Date/Time	Received By	Date/Time						

LABORATORY SECTION	Received By	Title	Date/Time
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

0014

1. SHIP FROM U.S. DEPT. OF ENERGY C/O Company <u>RHI Hanford</u> Address <u>233-S West Area</u> City, State, Zip <u>Richland, WA 99352</u> Contact <u>Davin ST John / Doug Bryant</u> Phone <u>509-776-8540 / 509-376-8273</u>					RADIOACTIVE SHIPMENT RECORD 1009153 Page / of 2																																					
2. SHIP TO Company <u>Quantura</u> Address <u>2800 Geo Wash Way</u> City, State, Zip <u>Richland, WA 99352</u> Attention <u>KAREN A. Lienberg</u> Phone <u>509-375-3131 EXT 135</u>					Ship <input checked="" type="checkbox"/> Prepaid <input type="checkbox"/> Collected Via <input checked="" type="checkbox"/> Motor <input type="checkbox"/> Air Pgr <input type="checkbox"/> UPS <input type="checkbox"/> Rail <input type="checkbox"/> Air Cargo <input type="checkbox"/> Site Carrier SHIPMENT AUTHORIZATION NUMBER																																					
5. HM Proper Shipping Name: _____ Radioactive Material: <input type="checkbox"/> excepted package - empty packaging 7 UN2910 <input checked="" type="checkbox"/> excepted package - instruments or articles 7 UN2910 <input type="checkbox"/> excepted package - limited quantity of material 7 UN2910 <input type="checkbox"/> excepted package - articles manufactured from natural or depleted uranium or natural thorium 7 UN2910 <input type="checkbox"/> Special Form, n.o.s. 7 UN2974 <input type="checkbox"/> Low Specific Activity, n.o.s. 7 UN2912 <input type="checkbox"/> n.o.s. 7 UN2982 <input type="checkbox"/> Fissile, n.o.s. 7 UN2918 <input type="checkbox"/> Surface Contaminated Object 7 UN2913					6. Markings Applied Radioactive - LSA <input type="checkbox"/> Radioactive - SCO <input type="checkbox"/> Type A <input type="checkbox"/> Type B with trefoil <input type="checkbox"/> LSA Description LSA-I <input type="checkbox"/> LSA-II <input type="checkbox"/> LSA-III <input type="checkbox"/> SCO-I <input type="checkbox"/> SCO-II <input type="checkbox"/> Labels Applied Empty <input type="checkbox"/> Radioactive White <input type="checkbox"/> Radioactive Yellow - II <input type="checkbox"/> Radioactive Yellow - III <input type="checkbox"/> Subsidiary Hazard <input type="checkbox"/>																																					
7. For Normal Form only Identity Physical Form <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Gas <input type="checkbox"/> Solid Chemical Form <input checked="" type="checkbox"/> Elemental <input type="checkbox"/> Metal <input type="checkbox"/> Nitrate <input type="checkbox"/> Oxide <input type="checkbox"/> Mixture <input type="checkbox"/> Other					8. EMERGENCY RESPONSE Telephone <u>509-373-3800</u> Emergency Response Guide(s) <u>161</u> Highway Route Controlled Quantity <input type="checkbox"/> Exclusive Use Shipment <input type="checkbox"/> with instructions <input type="checkbox"/> Placards Applied <input type="checkbox"/> If Rail Specify: Fissile Excepted, Grams <u>< 500</u> <input checked="" type="checkbox"/> Excepted Package Statement <input checked="" type="checkbox"/>																																					
Warning - Fissile Material Controlled Shipment. Do Not Load More Than <u>N/A</u> Packages Per Vehicle. In Loading and Storage Areas, Keep at least 20 Feet From Other Packages Bearing Radioactive Labels.																																										
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>11. No. Pkg.</th> <th>Model Package</th> <th>COC/Spec</th> <th>Serial No.</th> <th>Seal No.</th> <th>Isotopes</th> <th>T.I.</th> <th>Bq/Package</th> <th>Gr. Wt. Kg.</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Strong Tight</td> <td>N/A</td> <td>N/A</td> <td>TAPE</td> <td>PU-239/240, Am241</td> <td>N/A</td> <td>22X.06</td> <td>40.2</td> </tr> <tr> <td colspan="9"> Sample Number: <u>BONK43</u> Shipped in Poly Cooler Package in wet ICE </td> </tr> <tr> <td colspan="7" style="text-align: right;">TOTALS</td> <td>N/A</td> <td>22X.06</td> </tr> </tbody> </table>							11. No. Pkg.	Model Package	COC/Spec	Serial No.	Seal No.	Isotopes	T.I.	Bq/Package	Gr. Wt. Kg.	1	Strong Tight	N/A	N/A	TAPE	PU-239/240, Am241	N/A	22X.06	40.2	Sample Number: <u>BONK43</u> Shipped in Poly Cooler Package in wet ICE									TOTALS							N/A	22X.06
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TOTALS							N/A	22X.06																																		
(Shipper may describe package in detail on one of the unused lines above)																																										
12. This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation. Certifier's Signature <u>David St John</u> On behalf of DOE-RL Date <u>04/13/98</u> Organization <u>ERC-AFS</u> Complete Cost Code (Inc. End Function) <u>DR2233-068</u>																																										
13. Surface Dose Rate of Package <input checked="" type="checkbox"/> <0.005 or _____ mSv/hr <0.5 or _____ mrem/hr (N+B Y) Dose Rate @ 1 Meter from Surface of Package <input checked="" type="checkbox"/> <0.005 or _____ mSv/hr <0.5 or _____ mrem/hr (N+B Y) Additional Data and Instructions (inc. Readings on Internal Packaging) Signature - Radiation Monitoring <u>Judy</u> Smears of Outer Container <input type="checkbox"/> <0.41 Bq (22 dpm) & Y /cm ² <input type="checkbox"/> <0.04 Bq (22 dpm) a /cm ² <input checked="" type="checkbox"/> <TbL 2-2 HSRM Onsite Limits TRUCK LOAD OR EXCLUSIVE USE Surface <input checked="" type="checkbox"/> <2 mSv/hr (200 mrem/hr) @ 2 meters <input checked="" type="checkbox"/> <0.1 mSv/hr (10 mrem/hr) @ Cab <input checked="" type="checkbox"/> <0.02 mSv/hr (2 mrem/hr) (Using N+B Y) or sleeper Bldg. <u>233S</u> Survey No. <u>2335-10-045</u> Date <u>4/14/98</u>																																										
14. TRANSPORTER Vehicle Number <u>663-23803</u> DRIVER SIGNATURE <u>Doug Bryant</u> RECEIVER RECEIVER SIGNATURE <u>Davin St John</u> Date <u>4-14-98</u>																																										
15. OFFSITE AUTHORIZATION Shipment has been inspected and verified to be in compliance with DOT regulations Authorized Signature <u>M.A. S-HMS</u> Printed Name <u>M.A. S-HMS</u> Date <u>4-14-98</u>																																										
16. AUTHORIZATION FOR SHIPMENT <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:20%;"> AIR TRANSPORT CERTIFICATION <input type="checkbox"/> N/A </td> <td style="width:20%;"> CARGO AIRCRAFT <input type="checkbox"/> Cargo Aircraft Only Labels Applied </td> <td style="width:20%;"> PASSENGER AIRCRAFT <input type="checkbox"/> Ltd Qty <input type="checkbox"/> Research/Medical Diagnosis <input type="checkbox"/> Human Medical Research </td> <td style="width:40%;"> Pkg. Dimensions (cm) <u>4-12-00</u> </td> </tr> </table>							AIR TRANSPORT CERTIFICATION <input type="checkbox"/> N/A	CARGO AIRCRAFT <input type="checkbox"/> Cargo Aircraft Only Labels Applied	PASSENGER AIRCRAFT <input type="checkbox"/> Ltd Qty <input type="checkbox"/> Research/Medical Diagnosis <input type="checkbox"/> Human Medical Research	Pkg. Dimensions (cm) <u>4-12-00</u>																																
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17. OFFSITE AUTHORIZATION Tracking No. <u>RM1BH 2408</u> Date Shipped <u>4-14-98</u> Routing <u>CH2M</u> ETA <u>4-14-98</u> Surveyed By <u>N/A</u> Date <u>N/A</u> Approved for Shipment Offsite <u>M.A. S-HMS</u> Date <u>4-14-98</u>																																										

GAMMA-RAY ENERGY ANALYSIS REPORT
 Thermo Hanford Inc.
 Radiological Counting Facility THH - RCF

For Sample
 BOKH3

Project 233-S
 Customer ID BOKH2 Solution
 RCF ID RCF3067
 Sample time, date 4/8/98
 Analysis date 4/8/98

Isotope	Activity pCi/gm	2 s.d.	Ci/gm
K40	< 3.7e+00		3.7e-12
Co60	< 8.1e-01		8.1e-13
1129	< 8.6e+01		8.6e-11
Ca137	< 1.0e+00		1.0e-12
Eu152	< 2.4e+00		2.4e-12
Eu154	< 2.3e+00		2.3e-12
Eu155	< 1.8e+00		1.8e-12
Th232dau	< 2.8e+00		2.8e-12
U235	< 3.7e+00		3.7e-12
U238	< 5.6e+01		5.6e-11
U238dau	< 1.1e+00		1.1e-12
Np237	< 7.8e-01		7.8e-13
Am241	1.2e+04 +/- 3.6e+02		1.2e-08

Total Act Gam (pCi/gm) 1.2e+04 Ci/gm 1.2e-08

Y/Sr-90 < N/R
 Gross Alpha 3.0e+04 +/- 3.0e+03 3.0e-08
 Gross Beta 3.2e+03 +/- 4.5e+02 3.2e-09 Reported as 137-Cs Betas.
 AEA total 3.5e+04 +/- 3.5e+03

Total Activity (pCi/gm) 3.8e+04
 (Ci/gm) 3.8e-08
 239/240-Pu 2.6E+04
 241-Am 1.3E+04

Definitions: Note! 152-Eu is not a 100% Beta emitter.

All errors reported at 2 standard deviations
 A Assigned as residual beta from Gamma/Beta balance.
 For soils and natural samples, the following applies:
 The analysis of U238 is based on the activity of Pa234m

The analysis of Np237 is based on the activity of Pa233

U238dau is the activity of Pb214 and Bi214, short lived daughter products of U238. Equilibrium between parent and daughter products probably does not exist in disturbed materials.

Th232dau is the activity of Ac228, Pb212, and Tl208, short lived daughter products of 232Th. Equilibrium between parent and daughter products may not exist in disturbed materials.

Other samples, not containing natural materials, may have inapplicable results for the Th, U, transuranics and daughter products. The results must then be balanced for the gross alpha analysis.

N/R means no result or analysis not requested.

J. L. Ruff 4-9-98
 Radiological analyst Date

Albert I. Davis 4/9/98
 Radiological Manager Date

7071	Date 4/9
Long Beach	Page 1
Cal Dept.	From AID's
Phone 563-6462	Co.
Phone 373-9731	
Fax 376-8851	Fax #

Figure 1

SAMPLE CHECK-IN LIST

Date/Time Received: 4-14-98 1430 SG#: W02329
Work Order Number: 804238 SAF #: B98-068
Shipping Container ID: SML-76 Chain of Custody #: B98-068-05

1. Custody Seals on shipping container intact? Yes ☒ No ☐
2. Custody Seals dated and signed? Yes ☒ No ☐
3. Chain-of-Custody record present? Yes ☒ No ☐
4. Cooler temperature 4°C
5. Vermiculite/packing materials is Wet ☐ Dry ☒
6. Number of samples in shipping container: 1
7. Sample holding times exceeded? Yes ☐ No ☒

8. Samples have:
☒ tape ☐ hazard labels
☒ custody seals ☐ appropriate sample labels

9. Samples are:
☒ in good condition ☐ leaking
☐ broken ☐ have air bubbles

10. Where any anomalies identified in sample receipt? Yes ☐ No ☒
11. Description of anomalies (include sample numbers): _____

Sample Custodian/Laboratory: Loren B. Smith Date: 4-14-98

Telephoned To: _____ On _____ By _____

804238 Rad.

Client Sample Screening Results

14-Apr-98

② 4/14/98

CLIENT CODE ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTSA	NET CPMA	CNTSB	NET CPM B
BIII B0NK113		4/14/1998 2:30:00 PM	QUAD2113	4/14/1998 3:05:10 PM	B0NK113	10	27192	2719.12857	8424	841.49429
01	LIQUID		Bkg:	4/14/1998 5:29:05 AM	BKG	700	50	0.07142857	634	0.9057143
Anl Date: 4/14/1998	Tot Sa, Alq: 2.50E-02 ✓	1.00E-01 ✓	Alp: (Dpm/	8.46E+03	(uCi/ 9.53E-01	(pCV/ 3.81E+07	± 2.0E+05	CAT	6.6E-07	Lab
Ppt mg: 0.1 ✓	Units: L	ml	Bet: Alq: -5.38E+01	Sa: -6.05E-03	L/g: -2.42E+03	± 1.5E+04	III	2.5E-02	Alq	1-g

0019

004-Apr-98

DUE DATE 4-29-98

*** REANALYSIS REQUEST ***
CHAIN-OF-CUSTODY BATCH ANALYSIS RECORD

CUSTOMER BHE
MATRIX Other Liquid
PC/L

ANALYSIS Np237
SAMPLE DELIVERY GROUP W02329A
BATCH NUMBER _____

sa anal(4)

LAB SAMPLE ID	CUSTOMER ID	COMMENTS
1) 80448601	1.01 x E ⁻⁵	
2) 80448601	1.03 x E ⁻⁵	
3) W0448601	1.04 x E ⁻⁵	EQRL093 Pr. 4/1/97 Ex. 4/1/98
4)		
5)		
6)		
7)		
8)		
9)		
10)		
11)		
12)		
13)		
14)		
15)		
16)		
17)		
18)		
19)		
20)		

LAB QC ID		
BLANK) J044862B	0.2	EQRL091
SPIKE) J044863S	0.2	Pr. 4/1/97 Ex. 4/1/98
J044864S	0.2	EQRL092
		Pr. 4/1/97 Ex. 4/1/98

ACTIONS (Initial & Date)

1) INITIATED
SOP(S) #

NR 5-13-98
RICHRC0002 Rev 2

4) SEPARATION LAB RECEIVED
SOP(S) #

5/19/98 DM
RICHRC 5064, RO

2) PREP LAB RECEIVED
SOP(S) #

5-13-98 DM
RICHRC 5064-1

5) COUNTING/MEASUREMENT
LAB RECEIVED
SOP(S) #

5/21/98
RICHRC0002

3) SAMPLE REMAINDER STORED
SOP(S) #

5-13-98 DM
NR

6) DATA REVIEWED AND
ANALYTICAL PREP STORED
SOP(S) #

NR 5-26-98
NR 4-5-26-98
RICHRC0002 Rev 2

CPPT RB 5/21/98
RICHRC 5063

Data call 5/26/98 RICHRC 5063
RC-048 10/96 REV 3

0019